

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

MISCELLANEOUS PREY RECORDS OF SOLITARY
WASPS. III* (HYMENOPTERA, ACULEATA)

BY KARL V. KROMBEIN

*Entomology Research Division, Agricultural Research Service
United States Department of Agriculture*

Almost all the biological observations reported here were made at Plummers Island, Maryland, and at my home in Arlington, Virginia. At Plummers Island observations were made on several species of ground-nesting wasps, and on some wood-nesting species that utilized the abandoned frass-filled burrows (2-3 mm. in diameter) of anobiid beetle larvae in steps and rafters of the cabin porch. All the species observed in Arlington were nesting in abandoned anobiid borings in the wooden wall of an old, disused cowshed.

The opportunity is also taken to present some brief descriptive notes of the hitherto unknown male of the rare sphecoid wasp, *Xysma ceanothae* (Viereck).

I am indebted to the following specialists for the identification of prey or parasites of the wasps: H. C. Hockett (Muscidae), B. J. Kaston (Araneae), P. W. Oman (Cicadellidae, in part), K. O'Neill (Thripidae), L. M. Russell (Aphididae), W. W. Wirth (Tendipedidae), and D. A. Young, Jr. (Cicadellidae, in part).

Pompilidae

Calicurgus hyalinatus alienatus (Smith)

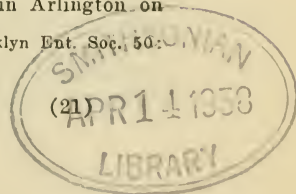
A female (61157 J), 9.7 mm. long, was captured with her paralyzed spider prey on June 11, 1957, on Plummers Island. She was dragging the spider over leaf litter near the cabin woodpile. The spider was a female epeirid 6.7 mm. long and about three-fourths grown, belonging to a species of *Neoscona*.

Sphecidae

Trypoxylon (Trypoxylon) backi Sandhouse

Two females (92157 B and C), 4.9 and 6.3 mm. long, were collected with their paralyzed spider prey on the cowshed wall in Arlington on

*Preceding parts of this series were published in Bull. Brooklyn Ent. Soc., 50: 13-17, 1955, and 51: 42-44, 1956.



September 21, 1957. The spiders were specimens of the liniphyiid, *Tennesseetum formicum* (Emerton), 1.1 and 1.7 mm. long, a penultimate instar male (92157 B) and adult female (92157 C). This wasp is multivoltine in Arlington.

Diodontus (Diodontus) atratus parenosus Pate

A female (92157 A), 5.7 mm. long, was taken on the cowshed wall in Arlington at the entrance of her burrow, September 21, 1957. She was carrying a paralyzed aphid nymph, 1.5 mm. long, of a species of *Drepanaphis*. This wasp is multivoltine in Arlington.

Mimesa (Mimesa) basirufa Packard

One female (61157 K), 9.2 mm. long, was taken June 11, 1957, on Plummers Island near the outdoor fireplace. She was flying with her paralyzed prey, an immature leafhopper, 3.2 mm. long. The cicadellid was probably a fourth-instar nymph of a species of *Idiocerus*.

Xylocelia virginiana Rohwer

I have made limited observations on several colonies of this species. Members of the earliest colony were nesting in pockets of soil formed between the roots of some uprooted tree stumps in Forest Lawn Cemetery, Buffalo, New York. Ten females and two males were taken between June 20 and July 13, 1934. One female on June 21 was transporting her prey, a paralyzed adult leafhopper, 4 mm. long, of a species of *Typhlocyba*. There was one generation a year at Buffalo, for no specimens were taken the rest of the summer of 1934. This colony was active again in June 1935.

There are two colonies located about 10 meters apart on the flat ground behind the cabin on Plummers Island. No observations were made on the nesting activities in 1956, but three females and four males were taken June 29 and July 11. In 1957 the larger colony consisted of about 50 females nesting in an area somewhat over 2 square meters. Adults were active from at least June 11 to July 2. Both sexes were flying low over the ground or alighting on the ground at 10 a.m., June 11. Several of the males attempted unsuccessfully to mate by pouncing on females on the ground. The females were digging burrows or provisioning their nests. The individual burrow entrances resembled small anthills, the fine grains of excavated soil being around the entrances in spoil heaps about 25 mm. in diameter and 3 to 6 mm. in height. The burrows penetrated the soil at an angle of 35° to 45° and varied considerably in the details of construction. Some went downward for 25 to 30 mm., then turned at right angles and continued down for another 25 mm. at the same angle. Others had an angulation only 10 mm. from the entrance and an additional angulation in another 20-25 mm. One was a straight shaft 32 mm. long.

All wasps at Plummers Island were provisioning with nymphs of *Prociphilus tessellatus* (Fitch), the woolly alder aphid. Nine aphids taken with or from wasps or found in burrows on June 11 (61157 A and C-I) ranged from 3.1 to 4.6 mm. in length (female wasps were 6.9 to 7.7 mm. long). I did not observe prey capture, but most of the woolly bloom is rubbed off the aphids during the process. The aphids are almost bare when they are brought into the burrows, and the head and thorax of the wasps are coated with the pale bluish bloom from the aphids. Members of

the colony in 1956 probably stored the same aphid, for female wasps taken on June 29 and July 11 were similarly coated. The prey is held in the mandibles during transport. Provisioning continued from 10:15 a.m. until 3:55 p.m., and wasps were still flying about when I left at 4:10. The burrow entrance is left open when the wasp departs on a provisioning flight. After returning with prey, the wasp pushes up a plug of loose soil from within (based on one observation).

An attempt was made to rear the contents of two cells found 25-30 mm. below the surface. These were the only completely provisioned cells that I found. The other burrows that I excavated contained only one or two aphids at the most and no eggs. Each of the completely stocked cells held five aphids, and one contained a newly hatched wasp larva, the other a wasp egg. The egg was 1.5 mm. long and 0.45 mm. wide at the middle, and the head end was a little broader than the tail end. It was attached to one of the aphids at the base of the second abdominal sternum along the midline and extended forward between the coxae to the hind margin of the anterior pair. The egg hatched between 9:30 p.m., June 12, and 6 p.m., June 13, and the newly eclosed larva began to feed through the middle of the thoracic sternum between the fore and mid coxae with its tail still attached to the second sternum. This larva was killed by mold on the following day. The older larva was larger but still feeding on the original aphid at 9:30 p.m., June 12. It finished its allotment of aphids by noon of June 15 and was then preserved for taxonomic study.

Many females of an Holarctic muscid *Leucophora sociata* (Meigen) were active on the ground in both nesting sites of *Xylocelia* at Plummers Island on June 11. Some of the flies seemed to be interested in the burrow entrances, though no oviposition was noted nor were any flies seen entering the burrows. Others dashed aggressively at wasps bringing in prey. Although additional observations are needed to determine the precise relationship between *Xylocelia virginiana* and *Leucophora sociata*, the following observations made in Scotland on the relationship between the bee *Andrena analis* Zett. and *Leucophora grisea* (Fall.) are rather illuminating. Huic (Scottish Naturalist, No. 49, pp. 13-20, 1916) found these two species in association. The flies remained in the nesting area and showed an interest only in those bees bringing in a load of pollen. After the bee had deposited her pollen load in the cell in the ground and departed on another provisioning flight, the fly might back into the burrow and deposit an egg about 10 mm. from the entrance and some distance from the cell. Huic found maggots, from which *L. grisea* emerged subsequently, feeding on the stored pollen, one to a cell, but never any bee larva, alive or dead, in such a cell. Her observations, however, do not rule out the possibility that the newly hatched maggot might destroy the host egg before beginning to feed on the stored pollen. Such an act would parallel the behavior pattern of newly hatched larvae of such diverse social parasites as the Miltogrammini in the Sarcophagidae, the Chrysididae, *Coelioxys* in the Megachilidae, as well as other genera of parasitic bees.

Another possible parasite of *X. virginiana* is the mutillid *Ephuta scrupea* (Say). One female was crawling over the ground in a nesting area on June 11. It feigned death when disturbed.

I was unable to visit Plummers Island between June 12 and July 1, 1957, but my colleague, G. B. Vogt, was kind enough to make some

observations on the colony during my absence. On June 16 he saw three wasps bring in aphids during a 15-minute period; several specimens of *Leucophora* were present in the area but no *Ephuta* were seen; several wasps engaged in excavating burrows had no aphid bloom on head and thorax. On June 23 he saw several *Xylocelia*, two of them engaged in excavation, and two *Leucophora*; no aphids were brought in during a 15-minute observation period. There was no activity on June 25 after a heavy rain, nor was there any on June 28. I looked intermittently for *Xylocelia* between 8:30 a.m. and 1:30 p.m. on July 2 without success. At 1:40 I captured one female on the ground without prey or aphid bloom—its mandibles were very worn. I saw another female at 1:45, likewise without prey or aphid bloom. Apparently this wasp is univoltine on Plummers Island as in Buffalo, New York, for no specimens were seen during the rest of the summer.

Stigmus americanus Packard

This species was nesting in large numbers in my cowshed wall during the entire summer of 1957. Females ranged from 4.0 to 4.7 mm. in length, and their aphid prey from 1.6 to 2.0 mm. All aphids taken with wasps during the latter part of the season were nymphs, except 91557 B which was an adult. The aphids were identified as follows:

- 9157 B, September 1, with *Drepanaphis* sp.
- 9257 A, September 2, with *Drepanaphis* sp.
- 91557 B, September 15, prey belonging to Panaphini (?)
- 91557 C, September 15, with *Drepanaphis* sp.
- 92257 A, September 22, with *Drepanaphis* sp.

This species was also nesting in the porch beams of the cabin at Plummers Island. Three wasps (83157 B-D), 4.8-5.4 mm. long, were taken with paralyzed nymphs of *Drepanaphis* 1.2-1.9 mm. long, August 31, 1957. This wasp is multivoltine in the metropolitan area of Washington.

Stigmus fraternus Say

Two females (91457 A and 92257 B), 4.7 mm. long, were captured September 14 and 22, 1957, on the cowshed wall in Arlington. The prey of 91457 A was an aphid nymph 0.9 mm. long belonging to a species of *Therioaphis*, and the prey of 92257 B was an aphid nymph 1.4 mm. long of a species of *Monellia*.

Passaloecus annulatus (Say)

This species nested both at Arlington and at Plummers Island in the habitats noted under *Stigmus americanus*. Two wasps (9157 C and 92157 D), 4.6 and 5.1 mm. long, were captured in Arlington, September 1 and 21, 1957, with paralyzed aphid nymphs 2 mm. long belonging to a species of *Macrosiphum* and to a species of *Drepanaphis*. Another (9257 C), 5.0 mm. long, was taken on Plummers Island, September 2, 1957, with an aphid nymph 1.4 mm. long belonging to a species of *Drepanaphis*. This species is multivoltine in the metropolitan area of Washington.

Passaloecus mandibularis (Cresson)

Two females (53057 A and C) 5.9-6.1 mm. long, were taken on my cowshed wall in Arlington, May 30, 1957. Each was clutching a paralyzed

wingless aphid by the neck. The aphids were 2.2-2.3 mm. long, 53057 A an adult and 53057 C a nymph, and belonged to *Macrosiphum rosae* (L.). This wasp is univoltine in Arlington.

Passaloecus relativus Fox

This species was nesting in the same habitat as *P. mandibularis*. One female (53057 B), 5.0 mm. long, was taken May 30, 1957, with a wingless aphid nymph, 1.7 mm. long. Another (6157 B), 4.5 mm. long, was captured June 1, 1957, with a wingless aphid nymph, 1.3 mm. long. This wasp also carried its paralyzed prey by clutching its mandibles around the aphid's neck. Both specimens of prey belonged to a species of *Aphis*.

Xysma ccanothae (Viereck)

This tiny wasp (females are 2.2-2.5 mm. long) is one of our rarest species, and through 1945 was known from just a very brief series of females. In 1954 I was fortunate enough to find a thriving colony nesting in my cowshed wall in Arlington, and I collected 27 females and 3 males between May 31 and June 13. Females were entering deserted anobiid borings, where presumably they nested in tiny galleries excavated in the anobiid frass as do some species of *Spilomena*. Nine of the females taken between June 2 and 12 were engaged in prey transport. Each carried a tiny, pale green thrips larva, venter to venter, its mandibles clutched around the neck of the thrips. The thrips larvae ranged from 0.84 to 1.01 mm. in length. Prey-laden wasps were taken from 10:15 a.m. to 4:15 p.m.

The species is nesting in much smaller numbers in rafters of the cabin porch on Plummers Island. Two females (62956 A and B) were taken June 29, 1956. Each was carrying a second-instar thrips larva 0.89 mm. long of a species of Thripinae (?). Another female (61157 L) was collected June 11, 1957, carrying a thripine (?) larva 0.80 mm. long. Miss O'Neill states that this is likely to be a flower thrips.

Since the male has never been described, it seems desirable to add a few descriptive notes detailing its differences from the female as re-described by Pate (Trans. Amer. Ent. Soc. 63:97-98, 1937).

Length 2.1-2.3 mm. Black and shining; the following ivory—mandible except apex which is light red, clypeus, subquadrate spot on front on either side of median lobe of clypeus which extends upward one-third of distance to anterior ocellus, scape beneath, malar space, anterior third of head beneath including mouthparts, proepisternum, fore coxa and trochanter; the following light fulvous—scape above, flagellum, foreleg except coxa and trochanter, mid leg and hind tarsus.

Head circular in frontal aspect, strongly arched behind eyes; malar space longer than in female, length at anterior condyle equal to length of antennal pedicel; antennal flagellum rather short and stout and with dense, short, suberect setae, the apical segment 0.8 times as long as preceding three segments combined; third and fourth abdominal sterna with posterior third or half with an arcuate band of dense, appressed setae; fifth and sixth sterna with shorter and more scattered, appressed setae; seventh sternum bare; exerted part of hypopygium narrow and acute, the sides converging toward apex, vestiture similar to that of fifth and sixth sterna.

Euplilis (Corynopus) rufigaster (Packard)

This species was first noted August 22, 1957, nesting in the porch of the cabin at Plummers Island. This fairly populous colony probably had been active for a period prior to the 22nd, for no males were taken between that date and September 20, the latest date on which females were active. Twenty-seven females captured during this period ranged from 4.6 to 6.0 mm. in length. All females captured with prey were carrying paralyzed, adult male and female tendipedid midges, varying in length from 1.5 to 4.0 mm. Provisioning of the nests was taking place as early as 10:30 a.m. and as late as 3:55 p.m.

Eleven midges taken from wasps were identified as follows: .

82257 A, ♀ *Tendips* sp., probably *nervosus* (Staeger), 3.1 mm.

82257 B, ♀ of unknown genus and species, 1.8 mm.

82257 C, ♀ *Cricotopus* species, 1.5 mm.

82257 D, ♂ *Tendipes nervosus* (Staeger), 2.8 mm.

83157 A, ♀ of unknown genus and species, 1.7 mm.

9257 B, ♀ ditto, but a different species, 4.0 mm.

9257 D, ♂ ditto, but a different species, 1.9 mm.

9657 A, ♂ *Calopsectra* species, 2.8 mm.

9857 A, ♂ *Procladius culiciformis* (Linnaeus), 3.8 mm.

9857 B, ♀ probably *Calopsectra* species, 1.5 mm.

92057 B, ♀ *Calopsectra* species, 1.8 mm.

When I reached the cabin at 9 a.m., September 20, a female *rufigaster* (92057 A), 5.1 mm. long, was excavating her burrow in an old frass-filled anobiid boring in the porch steps. At that time there was a circle of excavated particles of anobiid frass 5 to 15 mm. distant from the boring entrance. I was absent for the next hour and a half checking some other field work. At 10:32 the wasp flew in with a large pale green midge, holding it beneath her thorax, venter to venter, and head end forward. She left the boring two minutes later and returned with another midge at 10:37. Half a minute later she left the burrow and returned in another half minute with another midge. At this point I split open the boring with a knife and found that the wasp had excavated the anobiid frass from a section about 20 mm. long. The cell contained eleven midges and was not completely stored, for there was no wasp egg or closing partition. The midges ranged from 2.3 to 3.8 mm. in length, and comprised seven males of a species of *Calopsectra*, one female and two males of *Tendipes modestus* (Say), and one male of *Tendipes neomodestus* (Malloch).

Crossocerus (Blepharipus) ambiguus (Dahlbom)

On March 5, 1956, I split a section of board from the cowshed wall in Arlington. There were two cells in one of the abandoned anobiid borings, one of them containing a cocoon with some leafhopper fragments, the other containing adult leafhoppers, thirteen females and one male. The male leafhopper was a specimen of *Empoasca pergandei* Gill. and the females were probably the same species. The leafhopper fragments on the cocoon also appeared to be of this same species. The cocoon was kept in a heated room and on April 12 a male of *C. ambiguus* emerged.